

large spot left. 25th, a new group, surrounded by very prominent faculæ 1 day from east edge. 28th, large spot disappeared by solar rotation; it was over 30,000 miles in diameter. 30th, new group on sun's meridian, 1 spot 4 days from east edge.

Mr. H. D. Govey, North Lewisburgh, Ohio: sun spots were observed on the 15th, 20th, 22d, 24th, 25th, 26th, and 30th.

ATMOSPHERIC ELECTRICITY.

AURORAS.

Auroras were reported as follows: 12th, Montevideo, Minn. 16th, Orono, Me.; Wolsey, S. Dak. 18th, Albany, Oregon. 19th, Webster, S. Dak.

THUNDER-STORMS.

Thunder-storms were reported as follows: east of the Rocky Mountains thunder-storms were reported in the greatest number of states, 14, on the 29th; in 12 on the 11th; in 10 on the 31st; in 9 on the 1st and 31st; in 8 on the 27th and 28th; in 4 on the 10th and 12th; in 3 on the 2d; in 2 on the 7th, 21st,

DROUGHT.

The month was very dry and water scarce at Fayette, Mo. At Farley's Camp, Ariz., the month was reported the driest January since 1879. At Mount Carmel, Utah, and Eola, Oregon, the month was reported very dry. At San Diego and Santa Cruz, Cal., vegetation suffered for want of rain; at San Diego the drought was broken on the 28th.

23d, and 24th; and in 1 on the 3d, 5th, 6th, 8th, 9th, 18th, 20th, and 22d. On the 4th, 13th to 17th, 19th, 25th, and 26th, no thunder-storms were reported.

East of the Rocky Mountains thunder-storms were reported on the greatest number of dates, 10, in La.; on 9 in Tex.; on 8 in Miss.; on 6 in Ala. and N. Y.; on 4 in Ohio, S. C., and Tenn.; on 3 in Ark., Fla., Ill., Kans., Mich., Mo., N. C., and Pa.; on 2 in D. C., Ga., Ind., Ky., N. J., Okla. T., and Va.; and on 1 in Conn., Md., N. H., and W. Va. West of the Rocky Mountains thunder-storms were reported as follows: Cal., 5th and 6th; N. Mex., 7th. In states and territories other than those named no thunder-storms were reported.

VERIFICATIONS.

[Verifications made by Assistant Professor C. F. Marvin, assisted by Mr. H. E. Williams, chief clerk of the Forecast Division.]

FORECASTS FOR 24 HOURS IN ADVANCE.

The forecasts for districts east of the Rocky Mountains for January, 1891, were made by Major H. H. C. Dunwoody, Signal Corps, and those for the Pacific coast districts were made at San Francisco, Cal., by 2d Lieutenant John P. Finley, Signal Corps.

Percentages of forecasts verified, January, 1891.

States.		States.	
Maine.....	80.6	Kentucky.....	83.8
New Hampshire.....	78.2	Ohio.....	79.7
Vermont.....	76.7	West Virginia.....	81.9
Massachusetts.....	82.3	Indiana.....	89.5
Rhode Island.....	82.4	Illinois.....	86.9
Connecticut.....	84.2	Lower Michigan.....	85.0
Eastern New York.....	81.7	Upper Michigan.....	77.9
Western New York.....	83.5	Wisconsin.....	85.5
Eastern Pennsylvania.....	87.7	Minnesota.....	82.2
Western Pennsylvania.....	77.2	Iowa.....	90.4
New Jersey.....	87.0	Kansas.....	90.3
Delaware.....	84.3	Nebraska.....	90.0
Maryland.....	85.9	Missouri.....	89.4
District of Columbia.....	84.9	Colorado.....	87.7
Virginia.....	85.2	North Dakota.....	83.6
North Carolina.....	86.9	South Dakota.....	82.5
South Carolina.....	89.9	Southern California*.....	96.3
Georgia.....	90.6	Northern California*.....	91.2
Eastern Florida.....	90.6	Oregon*.....	83.3
Western Florida.....	89.8	Washington*.....	81.4
Alabama.....	88.3	By elements: Weather.....	86.7
Mississippi.....	89.5	Temperature.....	83.0
Louisiana.....	89.0	Monthly percentage of weather and temperature combined.....	85.2
Texas.....	82.7		
Arkansas.....	90.3		
Tennessee.....	86.3		

* In determining the monthly percentage of weather and temperature combined, the Pacific coast states are not included. † The forecasts of temperature in districts east of the Rocky Mountains for January, 1891, were made with reference to the maximum temperature alone; that is, a prediction of warmer or cooler indicated that the maximum temperature of the day designated would be higher or lower than the maximum of the previous day. ‡ The monthly percentage of weather and temperature combined is determined by multiplying the percentage of weather by 6, and the percentage of temperature by 4, and dividing their sum by 10.

FORECASTS FOR 48 HOURS IN ADVANCE.

Appreciating the great importance that long time predictions possess for the general public the Chief Signal Officer has authorized forecasts for 48 and 72 hours, covering the 2d

and 3d days in advance. These are optional with the forecast official, and are only made when clearly in the public interest, and cover, in all cases, considerable areas of country, and are not confined to localities.

Percentages of verifications of forecasts made for second day in advance. Number of predictions made: weather, 73; temperature, 43. Percentages of verifications: weather, 56.6; temperature, 90.2; weather and temperature combined, 66.1.

WIND SIGNALS FOR JANUARY, 1891.

Statement showing percentages of justifications of wind signals for the month of January, 1891:

Wind signals.—(Ordered by Major H. H. C. Dunwoody). Total number of signals ordered, 87; justified as to velocity, wholly, 73, partly, 7; justified as to direction, 81. Of the signals ordered 52 were cautionary, of which 41 were wholly and 6 partly justified; and 35 were storm signals, of which 32 were wholly and 1 partly justified. 33 signals were ordered for easterly winds, of which 29 were justified, and 54 were ordered for westerly winds, of which 52 were justified. Percentage of justifications, 81.7.

COLD-WAVE SIGNALS AND TEMPERATURE-FALL WARNINGS.

[Ordered by Assistant Professor T. Russell.]

Number of cold-wave signals ordered, 188; justified, 94. Percentage of justifications, 50.0. Number of temperature-fall warnings, 119. Percentage of justifications, 49.6. Percentage of justifications of cold-wave signals and temperature-fall warnings combined, 49.9.

Percentages of verifications of weather and temperature signals reported by directors of the various State Weather Services for January, 1891.

States.	Weather.	Temperature.	States.	Weather.	Temperature.
Iowa.....	84	93	New Jersey.....	82	88
Illinois.....	78	78	North and South Dakota....	75	84
Michigan.....	82	86	Ohio.....	83	89
Minnesota.....	72	86	Pennsylvania.....	86	86
Nebraska.....	88	89	South Carolina.....	92	94